CLAIMS

What is claimed is:

1. A method for photo-electrochemically etching a semiconductor sample, comprising the steps of:
   bringing a semiconductor sample in contact with an electrolyte liquid, thereby forming a contact area,
   irradiating the contact area of the semiconductor sample through the electrolyte liquid with UV light, thereby generating a photo current,
   measuring the photo current, and
   repeatedly subjecting the contact area to a jet of fresh electrolyte liquid.

2. The method of claim 1, wherein the semiconductor sample is made of gallium nitride.

3. The method of claim 1, wherein the contact area is irradiated repeatedly with UV light irradiation of said UV light for a predetermined time, whereby a waiting time is generated between each of said UV light irradiations, and wherein said jet of fresh electrolyte liquid is applied to said contact area in said waiting time between two of said UV light irradiations.

4. The method of claim 3, wherein the predetermined time is between 5 and 20 seconds.

5. The method of claim 3, wherein the predetermined time is 10 seconds.

6. The method of claim 3, wherein the waiting time is in the range between 1 and 10 seconds.

7. The method of claim 3, wherein the jet of fresh electrolyte liquid is applied at the start of the waiting time.

8. The method of claim 1, wherein the jet of fresh electrolyte liquid is created by a pump in form of a pressure surge.

9. The method of claim 1, wherein the semiconductor sample is held replaceable in a vertical position.

10. The method of claim 1, wherein the contact area has a diameter of 1 to 4 mm.

11. The method of claim 1, and further comprising the steps of providing a reference electrode at the semiconductor sample, and applying a voltage of -0.5 V to +0.5 V between the semiconductor sample and the reference electrode.

12. The method of claim 1, wherein the jet of fresh electrolyte liquid is applied for 0.1 to 2.0 seconds to the contact area.

13. The method of claim 1, wherein the electrolyte liquid is an aqueous diluted caustic potash solution (KOH) having a concentration in the range of 0.002M to 0.1M.

14. A device for photo-electrochemically etching a semiconductor sample, preferably made of gallium nitride, comprising:
a container to be filled with an electrolyte liquid,
a UV light source for illuminating a semiconductor sample with UV light through the electrolyte liquid,
means for measuring a photo-current (I) that is generated when said contact area is illuminated with the UV light,
an inlet for supplying fresh electrolyte liquid, said inlet being directed towards the semiconductor sample, and
an apparatus connected to the inlet for repeatedly creating electrolyte liquid jets, which are directed towards the semiconductor sample.

15. The device of claim 14, and further comprising a tank for holding fresh electrolyte liquid, wherein the apparatus for repeatedly creating said electrolyte liquid jets comprises a peristaltic pump, and wherein a tank for holding the fresh electrolyte liquid is connected to the pump.

16. The device of claim 14, and further comprising a plate for holding the semiconductor plate replaceable in a vertical position.

17. The device of claim 16, wherein the plate is mounted to the container from the outside thereof, when the semiconductor sample is placed on the plate.

18. The device of claim 17, wherein the plate is fixed in space, and wherein the container is moveable in a direction towards the plate.

19. The device of claim 14, wherein the container has a wall formed with an aperture, and further comprising a sealing ring mounted at the aperture, so that the sealing ring and the semiconductor sample may be brought into contact such that the border of the contact area is tight against liquids, when the container is filled with the electrolyte liquid.

20. The device of claim 19, wherein the aperture is placed in a vertical side wall of the container.

21. The device of claim 20, and further comprising a UV light transmitting window placed in a side wall of the container, wherein the side wall is arranged opposite to the wall containing the aperture.

22. The device of claim 14, wherein the container is made of a synthetic material.

23. The device of claim 19, wherein the sealing ring has an inner diameter of 1 to 4 mm.

24. The device of claim 19, and further comprising slide means for moving the container in a direction towards the plate and for pressing the sealing ring only up to a given maximum pressing force against the semiconductor sample.

25. The device of claim 24, wherein the slide means presses the sealing ring against the semiconductor sample with a given maximum pressing force.

26. The device of claim 25, wherein the pressing force is in a range of 50 to 300 cN.

27. The device of claim 24, wherein the slide means includes a spring.

28. The device of claim 14, and further comprising at least one current electrode and at least one voltage electrode for contacting the semiconductor sample, wherein the container includes a further current electrode and a further voltage electrode, and wherein a reference electrode is provided, which reaches inside the electrolyte liquid, when the liquid is filled into the container, without hindering the UV light during its passage through the container.

29. The device of claim 28, wherein at least one of the further current electrode and the further voltage electrode is made of platinum.

30. The device of claim 15, wherein the tank is filled with aqueous diluted caustic potash solution (KOH).

31. The device of claim 14, wherein the inlet is formed as a pipe made of synthetic material.

32. The device of claim 14, wherein the inlet has an inner diameter of 0.6 to 2.0 mm.

33. The device of claim 14, wherein the direction of the inlet and the surface, normal of the semiconductor sample, define an angle which is between 10 and 45°.

34. The device of claim 14, wherein the semiconductor sample is made of a composition of gallium nitride, which contains as an additive a material from the 3rd period of the Periodic table of the elements.

35. The device of claim 34, wherein the material is aluminum or indium.

36. The device of claim 14, wherein the container has an outlet valve for discharging the electrolyte fluid from the container.

37 The device of claim 16, and further comprising a vacuum device connected to the plate for holding the semiconductor sample thereon.

38. The device of claim 14, and further comprising a valve device connected to the inlet for supplying a fluid therefore.